ICI magazine

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Cover

Ebrahim Abdul Karim, a paint sales/technical service representative from Nairobi, was one of 12 members of ICI companies abroad who came to England on this year's ICI Overseas Course. While in the UK he completed a refinish and commercial transport painting course at Paints Division. Here he sprays a car door panel with 'Belco'.

Photograph: Otto Karminski

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opening a window

Philip Reilly

Photographs: Otto Karminski

For the past six years ICI companies abroad have sent carefully-selected young men to England on the annual ICI Overseas Course. At the end of April the 12 members of the 1967 course met at Warren House, the ICI staff training centre at Kingston-upon-Thames, on the outskirts of London.

These men were from eight companies in seven different countries, and except for 'Jit' Banerji of ICI (India), already in Britain on secondment to Plastics Division, had all travelled thousands of miles to take part. From the Far East they had flown over the North Pole; from Africa, Ceylon and Malaysia, across the Middle East and Europe. The aim of the course: to open a window through which they would see how the various activities of their own companies linked with other parts of the ICI Group throughout the world.

Unlike some of the courses at Warren House, the Overseas Course does not teach specialised techniques. As the members were told at the start, it presents a broad picture of what ICI does and how it does it. They were all specialists – in accountancy, or sales, or technical service; now they would look beyond their own jobs, their own countries.

Through discussions, case studies, talks by experts and meeting people at all levels in many parts of ICI they would broaden their knowledge of management, particularly in the commercial field. Above all they would be encouraged to think, to question, and to put forward their own ideas. On visits to Divisions, they would meet people who had previously been nothing more than names on pieces of paper. The first and last weeks of this two-month course were spent at Warren House; four weeks on visits to Divisions, Head Office departments and sales offices, during which they each wrote reports on projects set by their own companies; and two weeks based on IC House in London.

There were visits to the Houses of Parliament and the City, luncheon with Mr. M. J. S. Clapham, ICI Overseas Co-ordination Director, and talks with general managers. And at the end of it all there were impressions to be sorted out, notes to be consulted, and project reports to be presented during the final week. Those on the course were: Ceylon: K. Arichandran. Hong Kong: Jimmy C. H. Chen, Yue Tak Seng. India: A. Banerji. Japan: H. Kusunoki, S. Tamura. Kenya: E. A. Karim. Malaysia: M. R. Krishnan, Lo Yoon Kong, Tong Yik Lan, Andrew Yap Swee Heng. Nigeria: B. T. Orubo.

Even by the standards set in earlier years, this year's course was remarkable from the first day for informality and friendliness. Members were welcomed at Warren House by the Warden, Captain M. E. Butler-Bowdon, R.N., and David Lane (above) of Education Department, Millbank, and almost immediately joined freely in an "ice-breaking" introductory meeting where everyone spoke briefly about his own job, background and interests. David Lane, seen here with Berkley Orubo, Jimmy Chen and Hirokazu Kusunoki, organised and ran the course with a Millbank colleague, Keith Robertson.

Case-study sessions at which course members proposed and talked over their own solutions to industrial and commercial problems put to them by the directing staff were among the most popular activities. Each took it in turn to be chairman, and in the picture (right) the group are led by M. R. Krishnan of ICI (Malaysia) Ltd. They are studying the accounts of an imaginary company, drawing up a balance sheet, and discussing what they would look for in the accounts if they were either the suppliers or the competitors of such a company.

The only African on the 1967 course, although not the only member from an African company, was Berkley Tamuno Orubo (right) of ICI (Nigeria) Ltd. A pharmaceuticals sales representative from the Eastern Region of Nigeria, he holds a diploma in pharmacy. He joined ICI eleven years ago after six years in the Nigerian civil service and three years working on his own account.

If chairmanship is best learned by doing, running one of the first case-study sessions provided a severely practical lesson for M. R. Krishnan. He had to prepare an agenda which divided the overall problem into suitable sections, lead the discussions so that everyone had a chance to suggest possible solutions, and identify and summarise the answers which got most support. With ICI in Malaysia since 1948, he is in charge of commercial administration in industrial chemicals sales control, Kuala Lumpur Office.

'Don't be afraid to argue with the others in group discussions' advised David Lane. Taking him at his word (left) is Shoichi Tamura. A dyestuffs specialist, he has been with ICI (Japan) Ltd, for almost 12 years. For the past three years he has combined responsibility for the dyestuffs laboratory with his work as a techno-commercial salesman.

Visits were made to ICI Divisions, sales offices and Head Office departments to gather ideas and information for projects suggested by the members' own companies. Andrew Yap (right) sells agricultural chemicals for ICI Agriculture (Malaysia) Ltd. Places he visited while investigating marketing methods included Verdley Place, the headquarters of Plant Protection Ltd. at Fernhurst. He is seen in the gardens there, trying out a knapsack sprayer used in applying the PPL herbicides and crop protection chemicals.

opening a window

Lo Yoon Kong (above) is head of the paints sales section at the Singapore office of ICI (Malaysia) Ltd. For his special project he looked into the services provided by Paints Division and outside agencies to retailers, to increase shop efficiency and improve product display, and recommended how some of these might be used in Malaysia. He spent a week in the London sales office and two weeks at Paints Division Headquarters at Slough. Here he is seen in the Publicity Department studio.

The use of modern business machines at the Yalding works of Plant Protection Ltd. in Kent was of particular interest to Kanagaratnam Arichandran during his Divisional visits. He is company accountant of Chemical Industries (Colombo) Ltd. Seen with Peter Hooker and Heather Coyston, who is operating a machine which produces despatch documents, he is a chartered accountant and a graduate of the University of Ceylon. He played in the Ceylon Davis Cup tennis teams in 1964 and 1965 and has also played cricket for his university.

Ebrahim Abdul Karim, seen in the billiards room with Tong Yik Lan (right) and Lo Yoon Kong, is a paints representative with Twiga Chemical Industries of Nairobi. He specialises in technical service work, particularly colour matching and car spray-painting, and annually travels many thousands of miles by car and aeroplane to customers in Kenya, Uganda and Tanzania. Y. L. Tong is an agricultural techno-commercial representative at the Ipoh office of ICI Agriculture (Malaysia) Ltd. in north Malaya. He joined the company in 1962 after nine years in the Department of Agriculture, where he worked to improve yields from rice, cocoa and oil palms and was for some time a farm manager.

A 12-hour day of talks, discussions and study periods was usual at Warren House. But there was time also to relax before meals with a drink in the lounge, a game of billiards, or putting practice on the lawns. Seen above as he enjoys a tankard of beer with David Lane and Shoichi Tamura is Jimmy Chen (second from right), who for eight years has been with ICI (China) Ltd. in Hong Kong. He started as a salesman and is now a regional executive trainee. He speaks several Chinese dialects and his work frequently takes him into China.

Warren House, on Kingston Hill, was built in 1884 for Lord Wolverton and has been the ICI staff training centre since 1955. The former ballroom where (right) Andrew Yap is playing table tennis is now the main conference and lecture room. Its mirrored walls and ornate ceiling provide an elegant setting for the many courses and meetings held there during the year. The room was added so that a ball could be held to celebrate the coronation of King George V in 1911.

why Faraday matters

Tony Osman

Michael Faraday (1791–1867) in later life

A hundred years ago, on 25th August 1867, Michael Faraday died near Hampton Court. By then, he was famous as an experimental physicist, and had made discoveries that ensured his position among the greatest of scientists, although he had virtually no formal education. He was born in 1791, the son of a blacksmith driven to London by the economic depression caused by the French Revolution, and rapidly distinguished himself by his industry, his intellectual keenness, and his enormous care in making his observations.

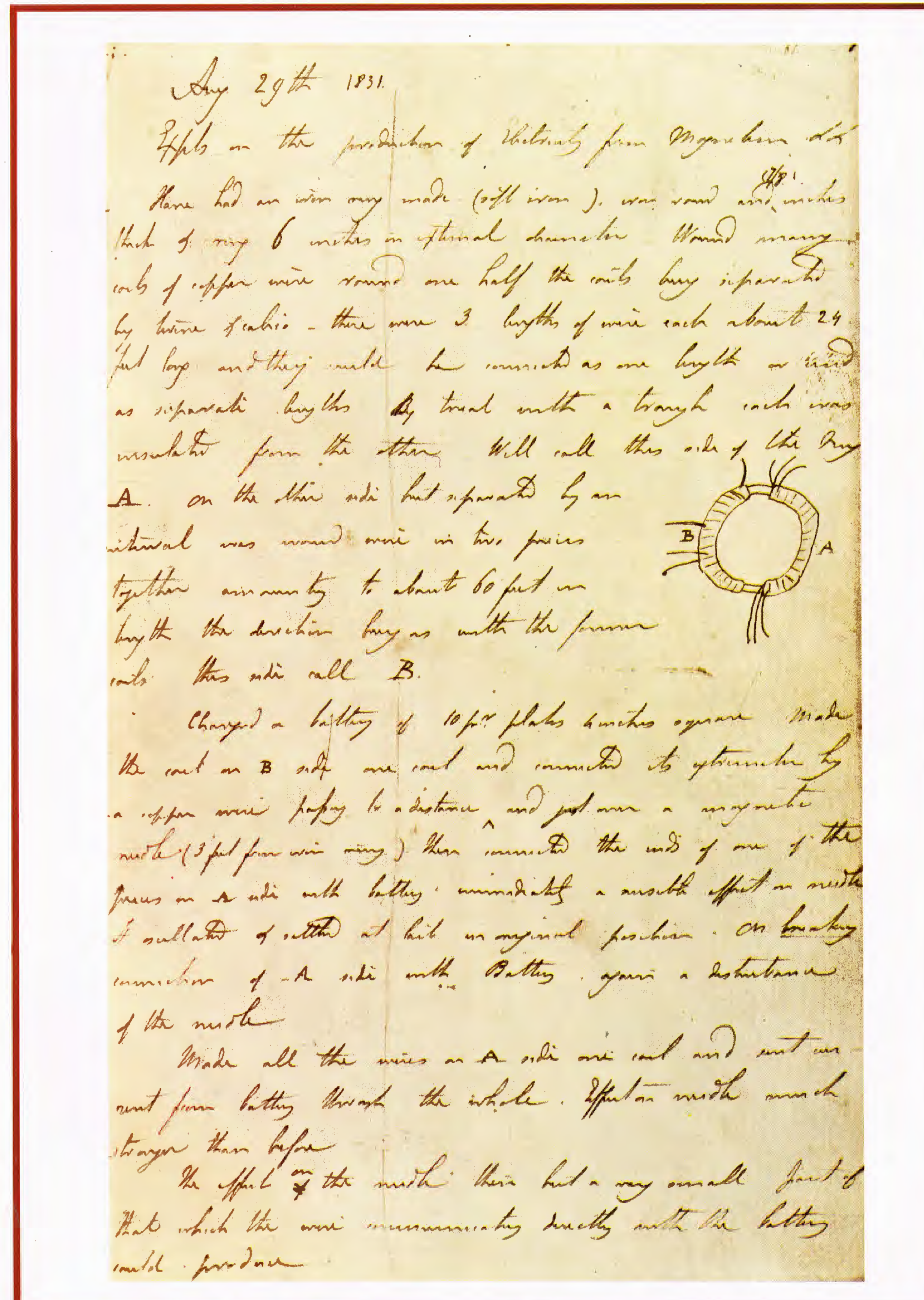
His main claim to fame lay in his discovery in 1831 of electromagnetic induction – the production of electricity from electromagnetic forces – and in the work that resulted from it. Because Faraday's life is so well documented – he kept a detailed journal himself, and much of his correspondence has been preserved – it is easy to see how one of the prevailing philosophies of the time gradually coloured his thinking and suggested the kind of discovery to be made. We can go further back and see how his early upbringing and his religious beliefs became part not only of his personality but of his scientific approach.

Michael Faraday's parents were Sandemanians – members of a small Christian sect that believed in a church completely separated from the State, worshipping in a simple way, its members secure in the knowledge that they had been saved by the Crucifixion. Its theology was supplied by Robert Sandeman, a Scottish itinerant preacher, one of whose arguments for the existence of God was based on the complexity of nature. This idea has inspired many scientists who were also religious people. The Sandemanians knew they were saved, so that they looked serenely at life, and they believed that true friendship was to be found only among others of their sect. Also, they were not interested in worldly goods. Faraday clearly showed the characteristic serenity and aversion to luxury and society.

The family moved to lodgings near Manchester Square, London, while Michael was still young, and he was apprenticed to a bookseller and bookbinder, a Mr. Riebau, when he was fourteen. This post, calling for manual skills, encouraged his dexterity – he was to become an outstanding experimental scientist – and it led him to another important influence on his life, the writings of Isaac Watts. Isaac Watts was a clergyman, a hymnwriter – 'O God our help in ages past' is still sung – and the author of a book called *The Improvement of the Mind.* Faraday carried his copy of the book everywhere. It was, in a way, typical of its time, offering guidance in self-improvement and was exactly what Michael Faraday needed. It recommended keeping a commonplace book of interesting ideas and facts; Faraday started one in 1809. It recommended attending lectures; Faraday began to go to scientific lectures by John Tatum at the City Philosophical School in 1810. Most important of all, it contributed a philosophical point of view.

Isaac Watts was one of those who considered that only that which could be observed was fact; that the student should distinguish carefully between words and things; and that one should not construct general theories upon only a few observations and experiments. All these rules provided an admirable discipline for experimental science, and Faraday applied them to his work. His life-interest also came from his employment. While binding a volume of the *Encyclopaedia Britannica*, he happened to read the article on electricity. Fascinated by the subject, he repeated, as soon as he could, some of the experiments he read about. The author of the article also put forward the unconventional idea that light, heat, and electricity were different modes of action of the same substance: in later years modifications of this theory underlay much of Faraday's major work.

The story of how Faraday came to have his first scientific post demonstrates his determination. He kept notes on the lectures he attended, and showed them to his employer. Riebau was very impressed and showed them, in his turn, to a Mr. Dance who lived nearby, who in turn showed them to his father. The father decided that Faraday deserved



Aug 29th 1831.

Expts on the production of Electricity from Magnetism &c.

Have had an iron ring made (soft iron), iron round and 7/8 inches thick & ring 6 inches in external diameter. Wound many coils of copper wire round one half the coils being separated by twine & calico – there were 3 lengths of wire each about 24 feet long and they could be connected as one length or used as separate lengths. By trial with a trough each was insulated from the other. Will call this side of the ring A. On the other side but separated by an interval was wound wire in two pieces together amounting to about 60 feet in length the direction being as with the former coils this side call B.

Charged a battery of 10 pr plates 4 inches square. Made the coil on B side one coil and connected its extremities by a copper wire passing to a distance and just over a magnetic needle (3 feet from iron ring) then connected the ends of one of the pieces on A side with battery. immediately a sensible effect on needle. It oscillated & settled at last in original position. On breaking connection of A side with Battery again a disturbance of the needle

Made all the wires on A side one coil and sent current from battery through the whole. Effect on needle much stronger than before.

The effect on the needle then but a very small part of that which the wire communicating directly with the battery could produce

Page in Faraday's notebook describing 'Experiments in the Production of Electricity from Magnetism.' Photograph: Science Museum

'I have always prepared and made my experiments with my own hands, working and thinking at the same time,' Faraday once wrote. Below: Two key pieces of apparatus: the induction ring (1831) and the electromagnet. With the induction ring (6 in. in diameter) Faraday showed that an electric current could be induced in a wire by moving it through a magnetic field. This established the principle of the dynamo. Faraday's electromagnet, 24 in. high and 15 in. across, was used by him from 1845 onwards. Photographs: The Royal Institution

encouragement, and gave him a ticket to hear Sir Humphry Davy lecture at the Royal Institution in Albemarle Street, London. This was Michael Faraday's first introduction to science as described by a practising scientist, and he was deeply influenced by it. He made a careful set of notes and showed them to the elder Mr. Dance; more importantly, he became a convert to Davy's scientific views and resolved to work with him. However, there seemed no prospect of his doing so. Then, later in the same year, Davy injured his eye in a laboratory explosion and was unable to write: Dance, who knew of Faraday's neatness and clarity, recommended him, and Faraday worked, for a few days only, for Davy. Nothing happened for a while, so Faraday sent Davy a set of bound notes made at his lectures. Davy was impressed, but there was no post available. Then luck intervened on Faraday's behalf – the laboratory assistant at the Royal Institution was sacked for brawling. In 1813, Faraday was appointed as assistant under Sir Humphry. He was given two rooms at the top of the building, and a salary of a guinea a week, plus fuel and candles. He still had this position eight years later, when he made his first great contribution to science – the discovery that electricity could be converted into mechanical energy.

The later discovery, electromagnetic induction, on which his true fame rests, took him a further ten years. However, many of the ideas that lay behind his belief that electricity and magnetism were connected, were developed during these early years with Davy, largely under his influence.

Chemistry had been greatly rationalized by Lavoisier's discoveries, published towards the end of the eighteenth century, but he had left one unfortunate legacy. This concerned the nature of heat. If a substance was heated, it became no heavier. Therefore, it was argued, a hot object contained a weightless fluid, heat or 'caloric', that flowed out of it as it cooled. The particles of caloric were mutually repellent, so that as more heat was put into an object, these particles repelled one another sufficiently strongly to make the object expand. Caloric, it was thought, was not the only weightless fluid. If a piece of steel was stroked with a magnet, it became magnetized. The interpretation of this was that some magnetic fluid had passed, presumably driven from the magnet by the mutual repulsion. The behaviour of the static electricity – the only kind known at that time – seemed to be explicable in terms of still more weightless fluids. However, a number of experiments at the turn of the century suggested that the time was ripe for new ideas about these fluids.

The major experiment was the discovery of the voltaic pile, the first electric battery, by Alessandro Volta, a distinguished chemist and physicist who was born in Como, Italy, in 1745 and died in 1827. He had made a number of important discoveries in chemistry and in what is now known as static electricity, when in 1791 he read Galvani's account of the connection between electrical forces and muscular movement. Galvani, who lived from 1737 to 1798, noticed that if he touched a dissected frog's leg with a knife while an electrical machine in the same room was producing sparks, the leg jerked. If the machine was not working, there were no kicks. Then he took the legs outside, hung them from a railing by a brass hook, and inserted a knife during a thunderstorm. Again, each flash of lightning produced a jerk. He carefully recorded that he used iron knives and brass hooks, but attached little importance to the nature of the metals – he thought that the effect was produced by the frog's own 'animal electricity'.

But Volta eventually decided that the difference between the two metals was all-important. He found that damped discs of metals, held together at one end and with the open ends touching the tongue produced a sour taste that he associated with a flow of electricity. If the two discs were separated by absorbent paper soaked in brine, the effect was better, and could produce jerks in animal muscles. Some pairs of metal discs were better than others, and he said that this was because some metals contained more electrical fluid than others. This electrical fluid would flow down a wire joining them. The effect was much more marked if sets of these discs were made up into a pile. This stack of pairs of discs was called a voltaic pile and was the first electric battery. It could produce a very high voltage – 100 volts was common – but the current was small.

Like many other wrong theories, Volta's theory of electrical fluids explained a lot of occurrences. However, it soon ran into difficulties. The discovery was reported in England in 1800, and two scientists, Nicholson and Carlisle, discovered something very odd. If the wire joining the top and bottom of the pile were broken and the ends put into water, the electric fluid passed through the water, but in doing so it broke the water up into hydrogen and oxygen. Very strangely, these did not appear at the same place: one appeared at one end of the wire, one at the other. At almost the same time, it was reported that light, another 'weightless fluid,' could decompose silver chloride, as we would now call it, and that caloric would reform it. Somehow, all these fluids were connected with chemical composition. Could they all be different forms of some single 'material'? And if they were, might they not all be convertible into one another?

Davy applied electrical decomposition – we call it electrolysis – to discover a number of new elements, and he was to use it in some of his first research with Faraday as an assistant. (Faraday was eventually to lay down two laws of electrolysis that are still known as Faraday's laws.) And Davy must have talked to Faraday of his belief, derived from German philosophy, that the world of physics could be explained by the interaction of forces. The fluids became unnecessary.

Finally came the discovery that started Faraday on the path to greatness. His work as a chemist with Davy had been distinguished – he was known as a superb technician and had already discovered benzene and tetrachlorethylene, as we now call them – but these were relatively minor discoveries. In 1820 came the news that Hans Christian Oersted, a Danish physicist who lived from 1777 to 1851, had shown that an electric current could affect a magnetic needle. The exact effect was completely unexpected. Most physicists had imagined that if there was an effect, it would run along the wire. In fact, the magnetic field was found to run round the wire – if the wire carrying a current was held along a magnetic needle, it produced a turning effect on the needle. As this was not the effect Davy had been looking for, neither he nor Faraday completely understood the discovery, and they made no progress at the time. About a year later, Faraday realised from some experiments that the magnetic effect ran round the wire, and not along it.

Faraday quickly made a machine. He stood a bar magnet vertically in some wax at the bottom of a basin, and poured mercury in. Then he joined a source of electric current to two wires, one going directly into the mercury, the other freely suspended above the magnet and dipping into the mercury. This second wire swung steadily round the magnet as long as the current flowed. He had shown that an electric current could produce a magnetic effect, and could thus be used to produce movement. This discovery was to lead to the manufacture of the electric motor.

His next problem was to show that a magnet could produce an electrical effect. His experiment first used an electromagnet, and the process is known as electromagnetic induction. He wrapped a wire round one side of a ring of iron, and prepared to connect the ends of the wire to a battery. The flow of current would turn the iron into a circular magnet. He wound wire round the other side of the ring, and connected the ends of this coil to a current-detecting device – a galvanometer. What he was trying to find out was whether the electromagnet could induce an electric current in the second coil. He believed that he was looking for an effect that did not last for long, so he watched the galvanometer

This panel in the bottom right-hand corner of the famous metal doors of Imperial Chemical House shows Michael Faraday lecturing at the Royal Institution. Huxley and Darwin are portrayed among other scientists seated in the front row

needle carefully as he connected the first coil to the battery. The needle moved, and then settled back in its original position. This was the effect for which he had been searching for almost ten years and was the basis of the transformer. By now, he was fairly clear about the next effect he wanted to produce – the induction of an electric current by a permanent magnet. He finally achieved exactly the result he wanted later in the same year, 1831. By moving a magnet through a coil of wire he induced an electric current. This ultimate discovery was the basis of the dynamo, and he had made a simple one before the end of this extraordinarily productive year. These discoveries set the seal on his fame.

He was known at the time as a great scientist. With hindsight, we know that he also initiated a new technology, for his discoveries were the essential part of the electrical power industry. The modern chemical industry is a major user of electricity, both for power and in a number of key electrolytic and synthetic chemical processes.

at home in the world

Michael Clapham

This article is adapted from a talk given to the Central Staff Conference in London on 11th July 1967

Some time in the first quarter of 1967, with no trumpets blowing, the ICI group of companies passed a notable milestone on its 40-year course. For the first time its sales outside the United Kingdom exceeded those within it. I do not say 'home' sales, because the UK is 'home' only for ICI, the parent company: this article is about the ICI Group, which is at home in the world. My first graph shows how our world-wide sales have developed over our history.

How much faster the sales outside the United Kingdom will grow than those inside it cannot be forecast: it depends partly on Government decisions about overseas investment which may or may not be wise, partly on the relative prosperity of different bits of the world, and partly on how soon we find ourselves members of the European Economic Community. One thing is certain, however: sales outside the United Kingdom *will* grow more rapidly and it would be a sign of failure if they did not. The total income of the world is something like £650,000 million a year, while that of the United Kingdom is only £30,000 million, and our income for various reasons is increasing at less than the average rate. The importance of the international operations of the ICI Group is bound to increase, and that will inevitably have certain implications for all of us in our work.

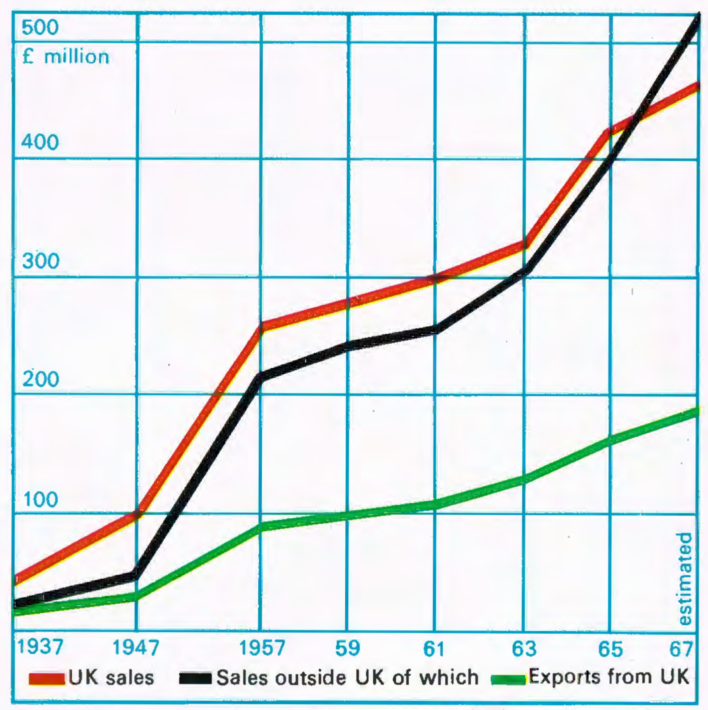
Why we operate overseas

Before examining these implications let us consider why ICI should operate overseas at all. ICI, like any research-based company in a field of changing technology, has two main products: chemicals – and ideas. Essentially, we operate overseas to make the most profitable use of our ideas. They may be inventions of new products or processes, or new methods of applying products, or new methods of marketing, or new techniques of organisation and management. They may be just additions to the whole mass of knowledge and skill in the brains and the records of ICI employees. It costs millions of pounds to produce these ideas – £30 million a year on research and development, and a good deal more on employing all the other people who contribute to the thinking of ICI; and the results are of enormous potential value. Obviously they are not of value in this country alone. It is our job to get the best possible reward for them in every country throughout the whole world where they can be used.

How do we set about it? Take the simplest case, a new product or process covered by patents. Basically, there are three choices.

First, we can manufacture solely in the United Kingdom and export to the rest of the world – as we are now doing with paraquat – always supposing that it is physically possible to supply the whole world's demands from this country. When we have adequate patent protection, that is the way we would want to start anyhow. But the minute our patents have expired – and often that will be a bare ten years after our first commercial plant has gone into operation – all our competitors in the world will be ready to come in and take the markets we have had, protected as they will be by their own countries' tariffs and by such 'natural' protection as carriage costs and the customer's preference for a supplier on the spot. At that stage we get forced back to our home market – 50 million people out of the world's 3,500 million – and such export markets as we can retain in the teeth of world-wide competition.

Secondly, we can, while we still have patent protection, license other firms overseas to make our product or use our process. Obviously this is the right thing to do if we have a process which can be used by industries other than our own: for example, the Billingham steam-reforming process, used under licence by about 55 organisations in 23 countries, for a reward of several million pounds so far. But if we are dealing with a new product, a polythene or a 'Terylene,' for example, we have to recognise that the lump sum payments and royalties we receive will never go on for much longer than the patent protection does: and again at the end of ten or twelve years we shall be left with strong competitors whom we have helped to build up, fighting for what markets remain to us.



Graph 1. ICI Group sales, UK and overseas

If then we want to make profits from our knowledge and skill *in the long run*, we have to do it by a third method. We have to use them ourselves, through companies overseas which we own or partly own – and the share of the profits we get depends on what proportion we own. But to build factories and develop markets quickly for important new products in all major markets of the world requires a tremendous organisation and enormous resources of money, which not even a company of our size can always deploy. For example, after the last war we had neither the technical manpower nor the resources to become the leading manufacturers of polythene or 'Terylene' in the countries of Western Europe and in Japan. Our situation today would be astonishingly different had we been able to do so. The main objective of our overseas strategy, therefore, must be to see that we do not again find ourselves unable to use our major inventions ourselves in the great markets of the world, and so get profits from them, not just for a decade but so long as they continue to be used. One further point about *why* we invest to operate overseas. We in the ICI Group – and people in other groups like ours – generate ideas and information; we apply them throughout the world and add back to our common stock the ideas and information which flow in from our world-wide operations. The process is one of organic growth, and we can only stop it at our peril. Fast-growing, research-based industries like ours tend, for good economic reasons, to grow ever bigger in size but fewer in number. Those companies which cannot spend on research and development what it takes to keep in the world league will soon go to the wall: and we cannot spend in the world league on the strength of a market of 50 million people plus the export markets accessible to us. We have no intention of going to the wall: and therefore we are bound to stimulate the growth of our overseas operations.

Where we operate

The biggest investments are in those parts of the map which are or used to be painted red. The reason for this is to be found not in logic but in the history of a company originally created within a framework of agreements with du Pont and I.G. Farben which gave each company its areas of influence. These agreements have long been ended, but owing to the war and its aftermath it was only in the 1950s that we were able to start to think logically about where our operations should be based.

Logic says that to use your assets of knowledge and skill in the most profitable way you will aim first at the big markets and the rapidly-growing markets, particularly those heavily protected by tariffs. But markets cannot really be measured by the number of people in them alone, or China and India would be the only two places we bothered to look at. Markets must be measured by the income there is to spend. Where is it to be found?

Just over one-third of the world's income is in North America. Just under a quarter is in Western Europe; rather under a sixth is in the USSR, and rather under a tenth in Japan. China, the whole of South America and India each have less than Japan. Finally, a bare 10% is spread over the continents of Africa, Australasia, the East European countries and the remaining territories of Asia. The picture is not a happy one for the humanitarian, but highly significant for the investor.

Now let us look at the rates of new growth in various areas (graph 2) which also point to investment opportunities, remembering that 'industrially mature' countries with full employment do not normally grow as fast as efficient developing countries using previously untapped resources. You will see that the enormous blocks of world income in Western Europe and North America are increasing at a satisfactory if not spectacular rate: 4% growth cumulative means doubling in 18 years. The fair-sized block now in Japan may not grow quite as fast as it has been doing, but even so it will probably double in the next eight or nine years.

The greatest growth, then, of ICI Group investment is likely to be in Western Europe and North America – and we now have to think of Western Europe as including the United Kingdom. A decision on whether or not the UK joins the EEC will alter the location of some of our investment within Western Europe, but will not alter the growth trend of our British and our continental interests combined.

The development of large-scale investment in North America is going to be more difficult, as we still have to break into the market as a major manufacturing concern. It may also be delayed longer than we would wish by Government restrictions on non-sterling investment. We can, however, be quite certain that it will come, and the setting up of ICI America Inc. is a portent.

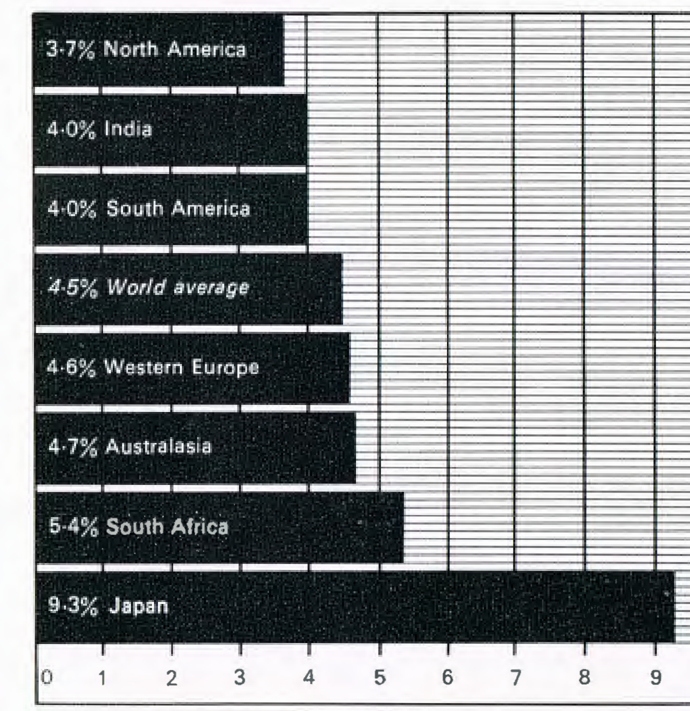
And where next? Logic points to Japan, but about that I am not yet prepared to prophesy. There would be tremendous gains, both technical and commercial, to be made from operating there, but there is perhaps no country in the free world where it would be harder for us to do so. Even if the present controls which prevent foreign companies having a majority interest in any Japanese company were changed, as they probably will be, there would still remain tremendous barriers of language and understanding to get over before we could really develop there in the way that would seem most logical.

How we invest overseas

Let us now look very briefly at how it is done.

At a time like this, when it is hard enough to find money for our development here in Britain, people may well wonder how we can possibly finance the growth of a world-wide chemical industry. The short answer is that we cannot and do not. We only remit in cash from this country a fraction of the total investment overseas. Even including ICI's share of profits retained in overseas companies, we have in recent years only contributed about £34 in every £100 of new assets acquired overseas.

It is a vital part of our strength that we are regarded, internationally, as a group whose name guarantees competent management and a reasonable prospect of growing profits. The consequence is that in every country the public is anxious to participate in companies we control. For example, the public issue for Chemicals and Fibres of India was oversubscribed 14 times, and that for the Chemical Company of Malaysia seven times, in their own countries. For the same reason, we can raise loan finance for these companies from banks, the national and international institutions and the public. We can also, as an international company, raise ICI loans overseas for our own equity investment.



Graph 2. Cumulative percentage growth of national income in selected areas of the world, 1956–65

The result, as graph 3 shows, is that 21% of all the finance of the Group comes from overseas, while 34% of all the assets of the Group are overseas. I expect that over the next few years the proportion of overseas finance will rise even closer to the proportion of assets overseas.

The need for international finance is of course one reason why so many of our overseas manufacturing subsidiaries are public companies with substantial national shareholdings. Public companies, as well as bringing in equity capital, can readily raise loan finance. In many countries, too, a company with local shareholders is politically more acceptable, and more closely identified

with the national interest, than one which is foreign-owned and controlled. This brings many advantages in practice: not least that it helps each company to recruit first-rate staff.

That brings me to another aspect of how we operate overseas: personnel (graph 4).

Just as a third of Group assets are overseas, so are a third of Group personnel. It is surprising that the proportion of personnel overseas is not higher, since the staff of all the selling companies are included in this figure, and they use very few assets. And some of our overseas companies are in relatively low wage areas, where manpower tends to be used less intensively. There is perhaps a lesson for all of us about the use of manpower in the UK.

Details of personnel policy overseas are the responsibility of the overseas companies. Naturally they differ according to local conditions and customs, but in general they tend to be as close to ICI's as circumstances permit – not least in the use of joint consultation. One principle, however, is clearly established throughout the Group: not only the works payroll employees but also the staff and management shall be drawn from nationals of the countries concerned whenever possible. When we invest in new fields of technology in developing countries it may take time for the educational system and our own training to produce the senior management needed: but it says something for our achievement that less than three in 1,000 of Group personnel overseas are long-term expatriates. The proportion is steadily reducing, though we mean to continue planned exchanges of senior staff between countries for cross-fertilization.

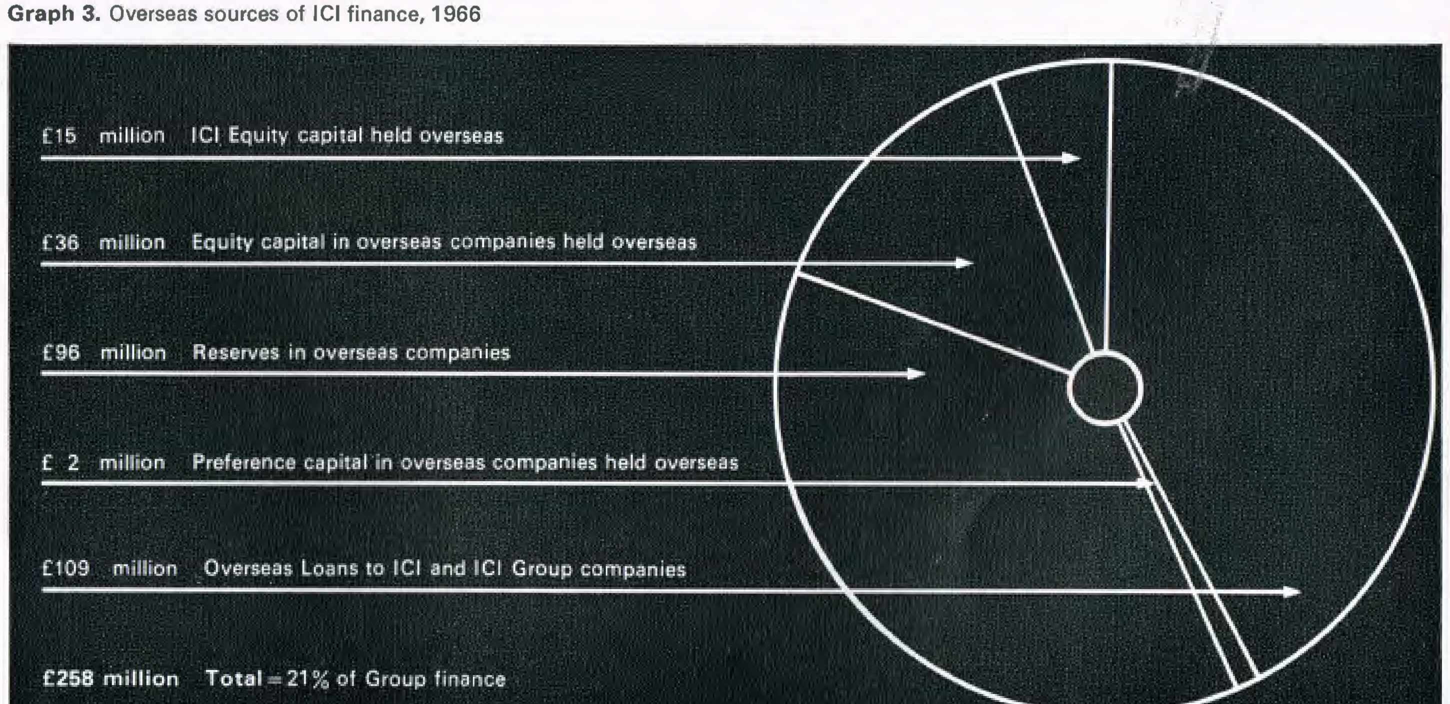
Finally, a word about how we supervise our interests.

Control – formal and informal

The chart opposite shows the organisation at Board level, which provides a Policy Group consisting of three or four directors for all the main territories where ICI companies operate. Once a year these Groups review the progress and discuss the policy and future plans of each company with senior directors from it; and special meetings are held if major problems crop up in the interval. Meanwhile the six Territorial Directors are responsible for maintaining contact, helped by the General Manager – Overseas, the heads of the Territorial Departments and their staff. The Territorial Director, the head of department, or both, are normally non-executive directors of the major companies in each territory. They are expected to visit them regularly and to know the management and the countries concerned well.

That is the formal organisation. But the real strength of ICI in its international operations is the informal work that goes into them, and particularly the two-way contacts between the staff of Divisions and their opposite numbers overseas. It is well recognised by the Board, though not set down in the organisation, that the managements of Divisions are carrying out an essential and invaluable 'corporate' job in looking for investment opportunities, in evaluating them for overseas companies, in giving technical and commercial advice, and in seconding and taking back the expert staff needed to start ventures in new areas. For all the work they do they are sometimes rewarded by royalties, but quite often not, so that their efforts are not always reflected in their Divisional accounts. They *are* reflected, increasingly, in the Company's accounts, in the rising sales and profits overseas. We are rewarded too in the broadening horizons and wide experience of those who take part in it. It is noteworthy that of the most senior management – Executive Directors, Division Chairmen and Deputy Chairmen, and General Managers – just under a quarter have served in one or other of the overseas companies.

Graph 3. Overseas sources of ICI finance, 1966

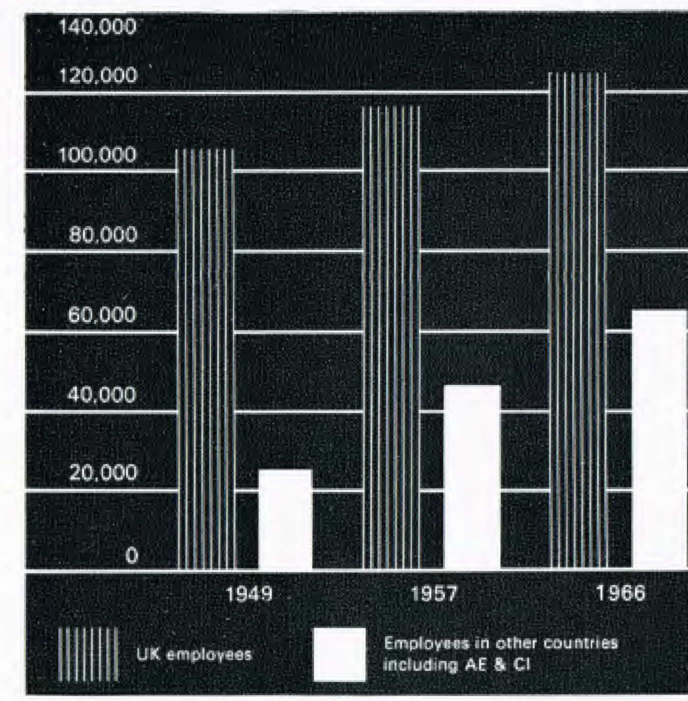


Conclusion

I said earlier on that the growing importance of our international operations has implications for all of us in our work. What are those implications?

The first is that the world is not only our market but also our theatre of operations. When we have a new product to launch, or when we need new capacity for an existing product, we should always ask ourselves where we can most profitably build our plants, and not assume that the UK is the first or the only choice. The UK is a rich country by international standards, but it only accounts for 4½% of world income. We shall only continue to be one of the great world companies if our strategy is aimed also at the other 95½%, in both marketing and manufacturing.

Secondly, we must always remember that manufacture overseas is not normally an *alternative* to manufacture in this country. A limit to what ICI can invest here is set by many factors: the markets we can reach by exports from here, the capital available here – which is largely determined by the level of our UK profits – and the manpower required to design, build and operate new plants. In manufacturing overseas we first tap *new* markets, then new sources of finance, and finally new sources of recruitment for management and operating staff.



Graph 4. ICI Group employees, including AE & CI

You may think that these two considerations affect only the most senior staff of the Company. So far as decision-taking goes this is true; though the most senior staff have all been junior once, and depend on their juniors for much of the thinking which goes into the development of the Company's business. But the third and fourth implications affect everybody.

The third is that no idea produced by any employee of the ICI Group has realised its full value till it has been made available to everybody in the Group who could use it. Major inventions, of course, will be well looked after by the system. But lesser yet valuable ideas emerge every day: ideas for improving some minor office routine, for saving maintenance on some item of plant, for improving the safety of a process, for stacking filled sacks more economically, and for hundreds of other ways of doing things better, quicker, or more cheaply. Everybody who originates such an improvement, whether he works in Billingham or Botany or Brownsburg, should remember that it may have uses far beyond his knowing wherever there are similar plants or offices, or piles of sacks: perhaps in Rishra or Rosario or Rozenburg or Runcorn. He will only do his best, for his own company and the Group, if his idea is made available to them.

And that brings me to one more implication of belonging to an international company, which is the need to communicate. We must have two objectives: to increase the flow of new ideas as much as possible, and to apply them as widely and as quickly as possible. There are all sorts of mechanisms for doing this – formal exchanges of reports, informal letters to one's opposite numbers in the other companies, conferences concerned with particular products, and, perhaps most important, conversations in the course of visits between companies in the Group – and the staff of the ICI Group travel about five million miles a year. An international company can only operate as such if its staff *thinks* internationally: if every one of us is out, all the time, to ensure that the Group is something much greater than the sum of its parts.

Supervision of ICI's Overseas Interests

ICI Board		
Overseas Policy Groups	*Chairmen*	*Members*
Australasia	P. T. Menzies	M. J. S. Clapham R. S. Wright
Southern and Central Africa	F. C. Bagnall	M. J. S. Clapham R. S. Wright
North America	Sir Peter Allen	J. D. Rose J. E. Sisson G. F. Whitby
Argentina	P. T. Menzies	T. B. Clark J. E. Sisson G. F. Whitby
India	Lord Beeching	M. J. S. Clapham J. D. Rose
Western Europe	E. J. Callard	F. C. Bagnall T. B. Clark J. H. Townsend
Malaysia	M. J. S. Clapham	J. D. Rose
Pakistan	M. J. S. Clapham	J. H. Townsend
Overseas Co-ordination Director		
M. J. S. Clapham		
Territorial Directors		
F. C. Bagnall	Africa south of 15° North Latitude (excluding Ethiopia and Somaliland)	
J. H. Townsend	Western Europe	
M. J. S. Clapham	Australasia, India, Pakistan, Far East and Middle East (including North Africa)	
J. E. Sisson	Latin America and Caribbean	
H. Smith	USSR, Bulgaria, Czechoslovakia, E. Germany, Hungary, Poland, Roumania, Yugoslavia, Albania, the People's Republic of China and Mongolia	
G. F. Whitby	North America (excluding Mexico)	
General Manager – Overseas and Territorial Heads		

people, projects, products

£30 million Indian fertilizer plant

The financing of the foreign exchange element of a £30 million fertilizer plant to be built by ICI at Kanpur, India, was completed on 26th June with the International Finance Corporation and National and Grindlays Bank. ICI's subsidiary, Indian Explosives Ltd., will operate the new plant, which will help to meet India's critical need for more fertilizer to increase domestic food production. It will also benefit the Indian balance of payments through foreign exchange savings. Left: Mr. M. J. S. Clapham, ICI Overseas Co-ordination Director and a Director of ICI (India), signs the investment agreement at Imperial Chemical House, London. With him are (left to right) Mr. C. A. Pitts, Chairman of ICI (India) and of IEL, Mr. A. L. A. Mudaliar, a Director of ICI (India) and of IEL, Mr. L. von Hoffman, of the International Finance Corporation, and Mr. K. Crawford of National and Grindlays Bank. An article from Mr. Clapham about ICI's growing activities overseas appears on page 122.

Knighted in Birthday Honours

A knighthood was conferred in the Queen's Birthday Honours on Mr. P. C. Allen, a Deputy Chairman of ICI, for his services to Britain's exports drive. Sir Peter, as he became immediately the honours were gazetted, is seen with his wife (right) and his two daughters, Miss Julia Allen (left) and Mrs. Rose Richardson, after going to Buckingham Palace to receive the accolade. Sir Peter was President of Canadian Industries Ltd., the ICI subsidiary in Canada, from 1959 to 1962 and has been Chairman of the CIL Board since 1962, when he returned to Britain. Since 1964 he has been a member of the British National Export Council and chairman of the Committee for Exports to Canada.

Other ICI men honoured were Mr. J. A. Lofthouse, HOC Division Chairman (OBE), Mr. P. L. Jones, a plant manager at Plastics Division, and Mr. S. G. Temple, technical manager, IMI (Kynoch)'s Copper Division (MBE).

Expansion on Tees-side

An aerial view of HOC Division's North Tees site, showing the 400,000-tons-a-year aromatics plant in the foreground. The Division recently announced plans for a further 500,000 ton-a-year plant, which will make the site the largest aromatics complex in the world. The new unit is designed to produce cyclohexane as well as benzene, toluene and mixed xylenes. Cyclohexane is used in making nylon, benzene in the manufacture of aniline dyes and of phenol, used in plastics and pharmaceuticals, and toluene for polyurethane foam components. A new paraxylene plant, also announced, will raise ICI's output of paraxylene – used in making polyester fibre – to over 200,000 tons a year. To be built at Wilton, it will be linked to the aromatics plant by pipeline under the Tees.

£1000 award

The biggest suggestion award ever made to one man at Wilton has netted £1000 for Mr. Laurence Currie, a 29-year-old plumber in the Wilton workshops. Mr. Currie worked out a method for making pipe branches which enables them to be produced more cheaply for sale in competition with other manufacturers. Seen receiving a cheque from Dr. D. G. Jones, a Deputy Chairman of HOC Division, he has previously received awards for other ideas submitted during the past year – but none for more than £5.

ICI enters roadstone market

As part of the expansion of its lime group, Mond Division has commissioned a plant at Tunstead Quarry, near Buxton, to produce one million tons a year of graded limestone for concrete aggregates and roadstone. Major contracts have already been won totalling more than half a million tons of stone for motorway construction, including two sections of the M1 and the M18 link road between Doncaster bypass and the M1. Above: Resonance screens in the main screen room at the plant divide the stone into eight grades.

adding up the atoms

John Wren-Lewis

Silicones are new materials which are based on the element silicon. This silicone gum (made at Nobel Division) is one of many sticky substances which can now be made with true scientific insight into the fundamental principles of adhesion.

Do one and one always make two? Obviously not: one dog plus one chunk of meat makes one well-fed dog. I believe a great many people find difficulties in learning arithmetic and other technical subjects for this kind of reason – that teachers start off by assuming things that aren't really obvious at all, indeed are actually false to a good deal of common experience.

'One and one are two' is in fact not a direct statement about ordinary life but *a special kind of artificially-simplified language* which turns out to be very useful for dealing with a particular aspect of life – the practical weighing-and-measuring aspect, the engineering aspect. Some of the new methods of teaching arithmetic that are proving so successful are based on getting children to undertake the sort of practical activities in which the need for this special, abstract language of counting becomes obvious. With this kind of approach, children who would have given up in the old days now find they can learn easily.

The point I am making here is that the block in understanding occurs *not* because the teacher's explanation is too complicated, *but because it is too simple*. An artificially-simplified language is presented as if it were obvious and universally true, and because the pupil can see that it is not he often concludes that the teacher must have access to some special knowledge which he (the pupil) is too stupid to grasp, so he gives up and turns to games or reading instead. And the same thing occurs at later stages in life when grown-up people say they 'can't get on with science'.

Chemistry provides a very good example of this. Most people have grasped the basic idea of chemistry, that everything in the world is made up of different combinations of ninety-odd elementary substances, but trouble is apt to occur at the very next step in chemistry teaching, when the teacher tries to convey the idea that a compound is not the same as a mixture of two elementary substances. One common practice in schools is to mix sulphur and carbon powders together, stir them thoroughly until the separate colours are no longer distinguishable, perhaps even press them together into a lump, and then contrast the result with the liquid compound carbon bisulphide, widely used for cleaning.

Here is another instance of one plus one making a new one rather than two – but it is not a commonplace instance, like the dog and the chunk of meat, and when the teacher tries to explain how it happens he or she is almost certain to commit precisely the same over-simplification as those who teach basic arithmetic as if it were obvious. In carbon bisulphide the carbon and the sulphur atoms are *combined* – but just what does that mean? The child – or the non-scientist adult – conjures up a picture of lots of tiny atoms of carbon holding on to the atoms of sulphur (always two at a time because he is told the formula is CS_2), but at the back of his mind is the nagging thought that even in a mixture the carbon and the sulphur atoms must be hanging on to each other *somehow*, especially if the powder *is* pressed into a block.

He is unlikely to be able to articulate this point, but it will lead him to feel uncertain about the whole distinction between mixtures and compounds – and what he is displaying is not stupidity, requiring even greater simplification from the teacher, but intelligence, requiring much greater sophistication in exploring the reasons for the special simplified language of chemical combination. For there are indeed forces holding atoms together in a mixture, and they are no different *in principle* from those that hold atoms together in a compound – they are all electrical forces produced inside the atoms themselves. The point is simply that some forces are very much stronger than others, and 'chemical combination' means something like an actual meshing of the outside shells of atoms so that very strong forces indeed are created between them, giving a new kind of substance composed of 'combined atoms' or 'molecules'.

Now there is more here than just a point of explanation for *teaching* chemistry. The fact is that when scientists fail to get over the precise nature of their concepts it can mean that they are misunderstanding the subject themselves, and in the history of chemistry something like this actually happened. Having grasped the idea of chemical combination, chemists during the nineteenth century created a new language to describe how compound substances can be made from nature's elements – the language of chemical formulae like H_2O. They got so carried away with the new possibilities that were opened up by this language that it scarcely occurred to them to question what relation, if any, there might be between the forces they were taking for granted every time they wrote down a formula like H_2O or CS_2 (carbon bisulphide) or $C_{12}H_{22}O_{11}$ (sugar), and the forces that keep the particles of carbon together in a pencil lead, or those that cause particles of water to hold together in a drop, or those that keep the particles of sugar together in a crystal.

Foamed plastics are very light yet have the insulating properties of air. A recent use is in 'Purlboard', here being installed in Salisbury Cathedral to prevent heat being lost to the ground from the underfloor heating cables.

Hence, at the time of World War I, physicists were gaily applying relativity theory to the stars, and chemists were making dyes and drugs of enormous complexity, yet there was no real science of the strength of materials. Elementary domestic questions like why a pencil lead crumbles when the wood doesn't, or why some things are sticky, or why a paint film hardens, or why rubber can be elastic on some occasions but hard on others, remained shrouded in mystery.

The solution to problems like these came only in the 1920s, when puzzles posed by the turn-of-the-century invention of artificial structural materials like celluloid and 'Bakelite' began to force chemists to face the 'idiot boy' questions which non-scientists have at the backs of their minds but don't usually like to ask. It began to become clear that chemical combination – the meshing of the shells of atoms – need not stop short at the production of compound atoms with simple formulae each measuring only fractions of a millionth of a millimetre: it can, under the right conditions, extend to thousands or millions of atoms, creating large lumps of material with the same kind of internal strength as atoms themselves have.

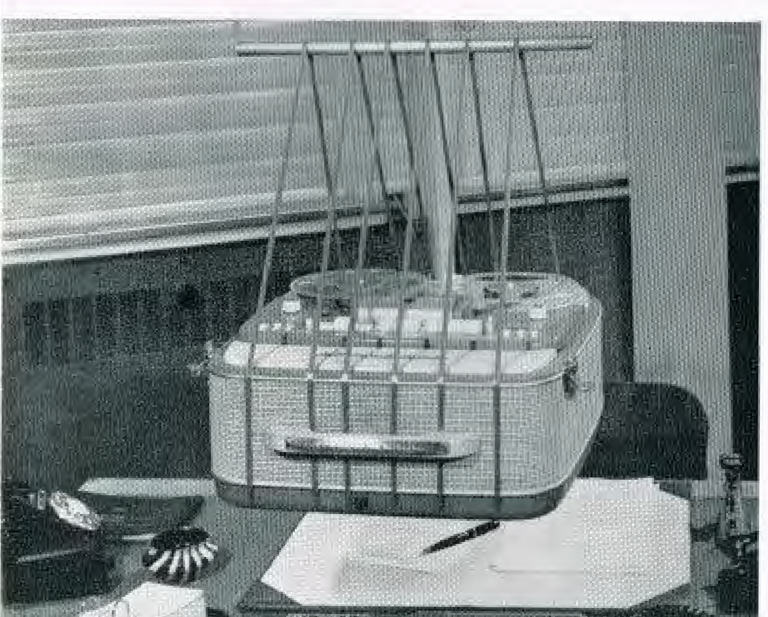
In fact some very strong materials like rocks cannot really be said to be composed of molecular particles at all – there are networks of chemically-meshed atoms (in this case, alternate oxygen and silicon atoms with some metal atoms in attendance) straggling right through the mass. In materials like rubbers or plastics there *are* molecules, but they are still vastly bigger than the molecules of ordinary chemicals: they are chains consisting of many tens of thousands or even hundreds of thousands of atoms – usually carbon atoms flanked by attendant hydrogens – whose length could be measured in quite large fractions of a millimetre, and which get so tangled together that the material is able to 'cash in' on the strength of the chemical bonds within the chains to a considerable degree, while still being more flexible than rock.

In rubber this flexibility becomes elasticity because the meshing between the atoms takes place in such a way that the chains have a tendency to curl up like springs; but when rubber is vulcanised with sulphur, atoms of sulphur combine with the chains all along their length and join the chains together, so that a rigid material is produced. And when an oil-based paint hardens it is because oxygen atoms from the air do the same kind of thing to the rather shorter chain molecules (a few dozen atoms long) which make up the thick liquid of the paint-vehicle. This process is called 'cross-linking'.

This kind of understanding, achieved only in quite recent times, has opened up a whole new frontier of applied science, and a great deal of ICI research and development takes place on that frontier. For example, new developments are constantly being made to improve the process of painting by

Technically speaking, painting is primarily a matter of covering a surface with a film, for protection as well as colouring. ICI's 'Electrocoat' process is a major advance in applying science to achieve this on the conveyor-belt scale. Up to 75 petrol tanks an hour can be drawn through this 3,000-gallon dip tank.

Persuading metals and plastics to work together is one of the major achievements of modern science, of enormous importance in the electronics industry. ICI 'Melinex' polyester film is widely used for recording tape; bottom picture shows it displaying its strength by holding up a 'Grundig' tape recorder.



controlling the cross-linking process. In car paints, for example, we no longer rely on natural oils that happen to be cross-linked by oxygen – cross-linking is achieved by a different chemical reaction induced by heating. And because even this is a long process which holds up the conveyor belt, research is going on now into the use of electron beams which can make cross-linking take place very quickly with the right kind of specially prepared paint.

The same kind of insight has made it possible in recent decades to understand just what it is that makes a good adhesive for sticking things together. The invention of glues has ceased to be a matter of mixing up things that happen to be sticky, and has become a proper science-based technology – a frontier of research of great importance for modern industry, including ICI.

It is also possible to tailor-make chemicals which cross-link into solid masses of different kinds for different purposes. The chemicals known as polyurethanes have interesting properties in this respect – they will cross-link to make particularly hard paint-films, but they can also be made to cross-link in a solid mass, and if this happens under the right chemical conditions, bubbles form throughout the mass so that the result is the now-famous 'solid foam' type of plastic. An important application of this for building has recently been achieved with the introduction of 'Purlboard'.

On another sector of this very wide frontier was the research that took place in the inter-war years on the possibility of imitating the kind of silicon-oxygen meshing that occurs in rocks. At first chemists wondered if they could make silicon atoms link up in chains as carbon atoms do – there are a number of resemblances between silicon and carbon – but this did not happen. What did emerge were materials based on silicon, oxygen and carbon atoms in chain-like combinations – the silicones – and new developments on this frontier are still going on.

On yet another sector, research has begun to throw light on just how the electrical forces in atoms 'spill over' into the very much weaker forces that hold particles together when there is no actual 'meshing' of atoms – and this has led to the recognition that some molecules have shapes which maximise these forces, giving to materials strength of rather a different kind from the strength of cross-linked chain molecules. In particular, this kind of strength is obtained when the groups of meshed atoms happen to lie side by side in regular fashion like a solid version of the repeating patterns of wallpaper – a situation which in mineral substances produces crystals, but in substances like nylon produces material with just the kind of strength needed for making fibres. (Hence the apparent paradox, to the layman, that scientists can be heard talking about 'crystallinity' in fibres.)

From this sort of basic research comes an understanding of the special structural properties of metals (which appear to break the rules because they *don't* have huge molecules – the secret being in their regular or 'crystalline' structure) and of how metals and plastics can work together – a discovery of immense importance for modern electronics.

These are still only a few examples of the exciting events happening on this relatively new frontier, and ICI scientists are involved all along it in their search for new products to meet the ever-growing needs of society.

I bought an island

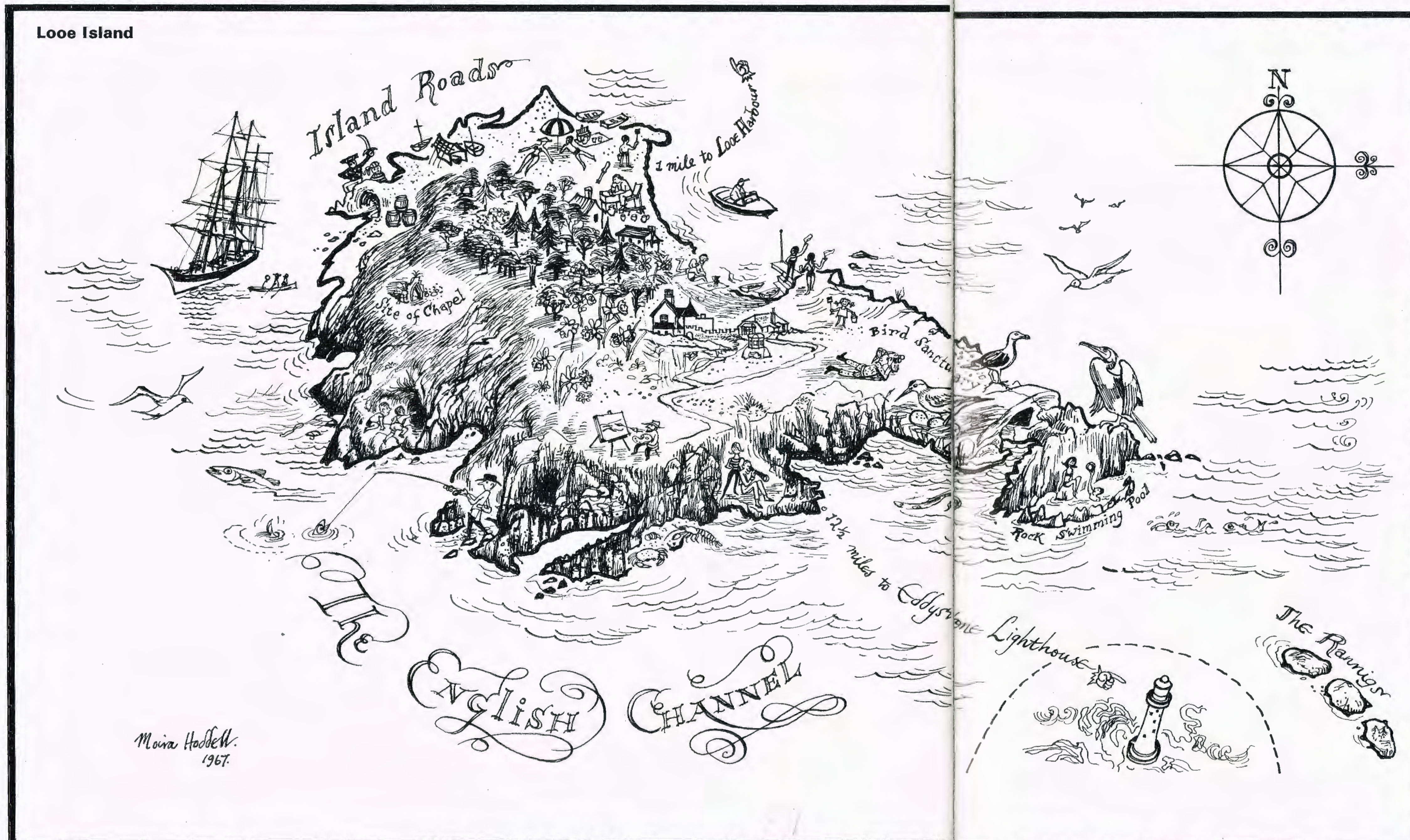
Evelyn Atkins

Looe Island lies half a mile off the coast of South Cornwall

In the autumn of 1963, a few months after I retired from ICI, my sister and I bought two fishermen's cottages at Looe in Cornwall. A few months earlier I had attended a course run by the potter John Shelly. I had enjoyed this so much that I decided to take up pottery seriously and eventually to use one of the cottages as a studio. My sister was still teaching at the time, so we returned to London and I enrolled as a part-time pottery student at Epsom Art School. The school holidays we spent at Looe working on our cottages.

Islands have always had a special fascination for me and I have long wanted to own one. Looe Island, a mile out from the harbour, looked a dream island, so you can imagine our excitement when we heard that it was to be put up for sale.

We obtained an order to view the same day and made an offer on the spot, which was accepted. The owner, who was leaving the island owing to illness, was anxious that it should not fall into the hands of developers and be spoilt. He liked our idea of making it a craft centre and generously lent us half



the money on mortgage. (I heard later that he had refused another offer far higher than ours.) Our luck held when a few weeks later the senior women's teaching post at Looe quite suddenly became vacant. My sister applied, and got the job.

The following January (1965) we moved our belongings to the island. Getting them there took four trips in an open boat between gales and storms. Each trip there was only time to pile everything into the house, as the storms usually worsened and we had to leave in a hurry. Our own move took place a few weeks later. The island had been unoccupied for six months and the water tank had weeds in it, so to start with even water had to be brought over by boat from the mainland.

Looe Island covers 22½ acres and lies half a mile off the coast and a mile from Looe Harbour. The landscape – and seascape – is very much Cornwall on a smaller scale, as in the pictures opposite. One shows me feeding my pet goat Frederica, the other, a part of the south coast. Our home is the Island House, the largest of three on the island. Its date is unknown but it has walls four feet thick. The island undoubtedly was a smugglers' haunt in the past, and from even earlier days ruins remain of a twelfth century chapel.

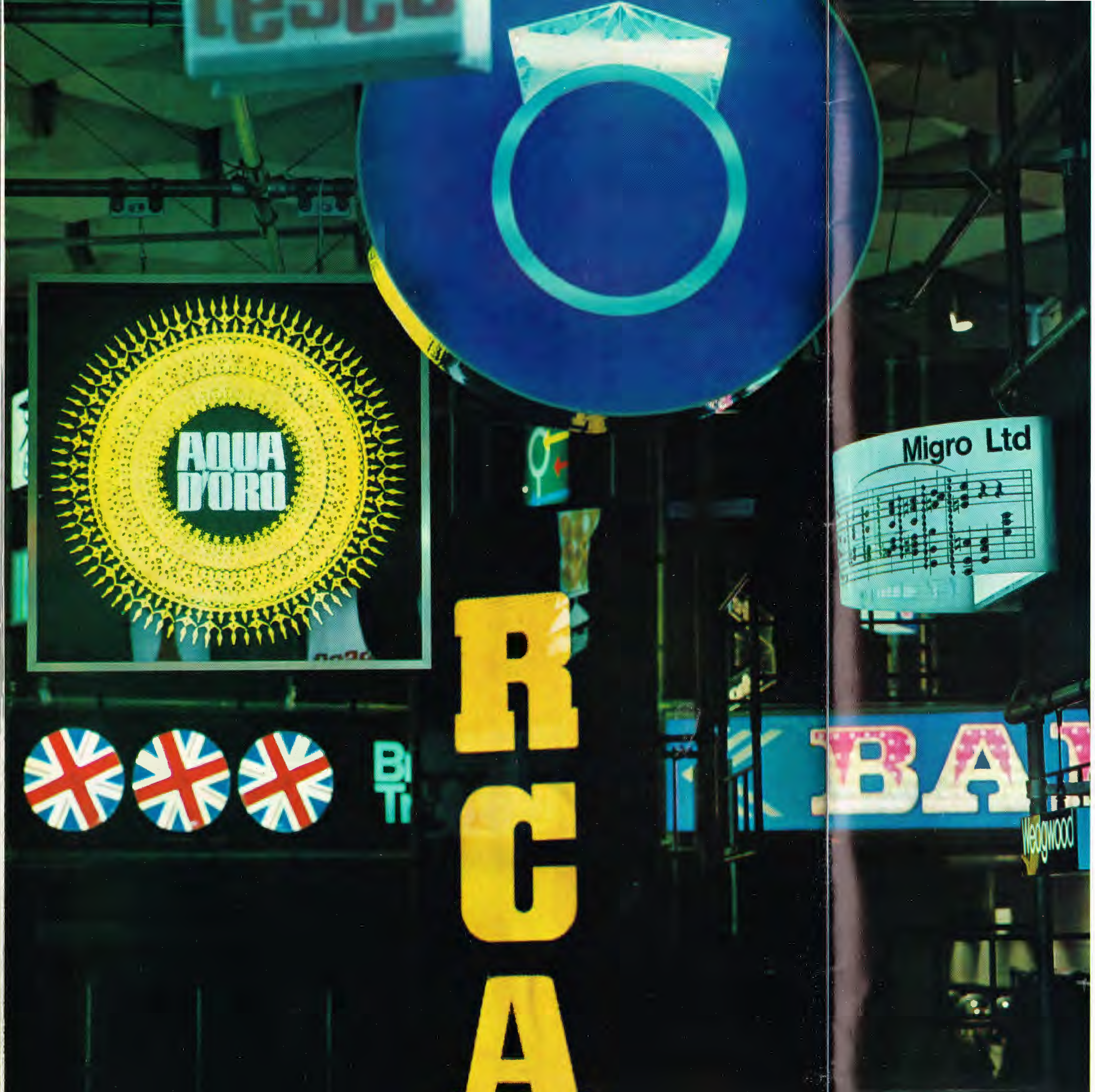
After the second world war a D-Day general ran a market garden and daffodil farm on the island. The daffodils are still there and within a week of our arrival they were in full bloom. They had to be picked, bunched and boxed and shipped across to the mainland to catch the 'Covent Garden Flower Express'.

That summer, with the help of friends and local fishermen, we decorated and furnished the other two houses on the island – the smuggler's cottage and the jetty cottage (a converted barn) – ready for letting to visitors; converted the battery room into a pottery; installed a wheel, made for me by John Shelly, and a kiln, my farewell gift from ICI. We also bought a stone-cutting and polishing machine. We had a number of day visitors – the island had not been open to the public in living memory – and opened a café and the craft shop.

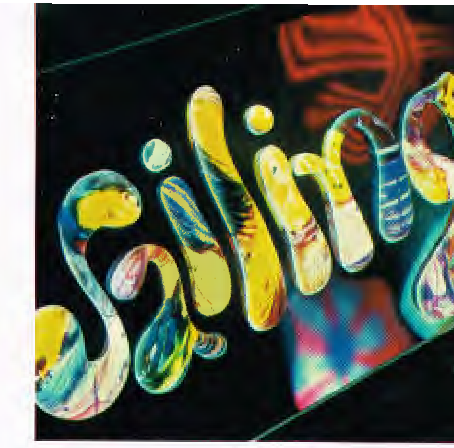
Last year and this we have been in full swing. The cottages have been fully booked and we have held courses in woodcarving, pottery and stone cutting. There is still a great deal to do, but our visitors are mostly only too eager to help even with the dull jobs like digging, weeding, cementing steps and so on. One man, who owns a building firm, earned our undying gratitude by plumbing in an extra 1000-gallon water tank and laying water to the pottery and hennery.

We make a point of meeting all visitors to the island and take them on a short tour. I have quite a correspondence with some of them. An artist in stained glass whose work is in churches all over the world sent me a parcel of stained glass, complete with technical details, for use in the pottery. Another, whose hobby is stone-cutting, sent me some American magazines on the subject and a wonderful parcel of precious and semi-precious stones from South America and Mexico.

My sister and I are members of the National Trust and the Bird Preservation Society and all fees are used for the upkeep of the island and its preservation as a beauty spot and wildlife sanctuary. It is not National Trust property, of course, but our own, but we have made a covenant that no future owners can commercialise it. People seem to find our island an ideal place to escape from the 'rat race' for a while and just soak up the sheer beauty of it all. We intend to carry on making crafts ourselves, to give our visitors the chance to try their hand, to arrange even more courses, and gradually to develop the island as a craft centre and for writers and artists. We are still subsidising it fairly heavily, because everything that comes in is being ploughed back for improvements and more craft equipment. When we bought those fishermen's cottages in Looe four years ago I made three wishes. First, that I might get the chance to rent the milk store alongside our cottages to house my clay stores. Second, that I might own a boat. Third, that Looe Island might one day be up for sale. We own the island. We have not one but three boats. We were recently offered the milk store to rent, and it now houses clay and craft equipment in transit to the Island.



PROSPEX 67



Brigid Keenan

The first major use for 'Perspex' had nothing to do with home or fashion. It was used to make the transparent canopies for wartime fighter planes, and not used by chance, but developed especially for this purpose. Even in those days, twenty-five years ago, young airmen spotted its decorative potential – they used to carve jewellery, cigarette cases and lighters out of the disused canopies as souvenirs for their girl friends. Though the years immediately after the war were disappointing in that they produced no other use for 'Perspex' in fashion than as spectacle frames, umbrella handles and buttons (all very useful, no doubt, but design-wise hardly revolutionary) it is the two basic qualities of 'Perspex' –

decorativeness and easy working – which attracted the airmen that have made it a natural for further exploitation today. Clear and transparent as glass, it is lighter, easier to work and not so fragile, and comes in a range of over a hundred different colours.

At the recent Royal College of Art exhibition, Prospex 67, visitors were introduced to 'Perspex' by a display of *twenty-two* different ways of working the stuff, from screen printing, multiple laminations and vacuum forming, to engraving, mirror finishing, and sandblasting. 'Perspex' nowadays is like some glorious man-made quartz that comes in any colour or no colour, or, truly quartz-like, can be made up into 'sandwiches' of different colours. Students taking part were excited by this plastic that lends itself so perfectly to three dimensional shapes; visitors were excited by the exhibition itself. Designers are still almost at the beginning with 'Perspex', and this RCA exhibition (supported by ICI, who supplied the 'Perspex' and also invited students down to their laboratories to experiment) was the first whole exhibition at the college to be devoted to this material and the first time designers using it had been given their heads without the thought of commercial acceptance to tame their ideas. A great part of the exhibition was composed of shop signs – vivid and exciting – but I found the 'Perspex' objects more interesting: a chunky chess set (see back cover), screens, a chair, and a television set embedded in a great round bubble of transparent 'Perspex'. David Colwell's showcases made of 'Perspex' and lit through 'Perspex' rods were one of the exhibition's biggest successes. They sum up two of the fields in which this plastic is at its most successful: display and lighting. The Sander Mirror Company (the biggest retail outlet for 'Perspex' furniture in this country) have already supplied Aquascutum with twelve clear 'Perspex' boxes for display, and when dress designer Roger Nelson had his showroom re-done lately he used all 'Perspex' furniture.

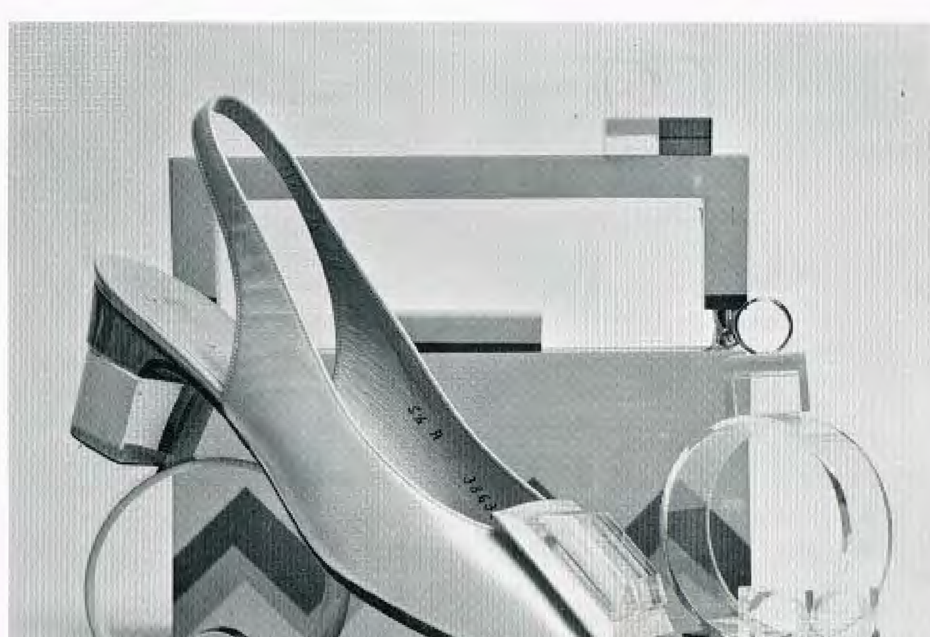
Even more exciting perhaps is the use of 'Perspex' for light transmission. David Colwell's showcases demonstrated how 'Perspex' rods carry light from a central source along their length to shine out from the end of the rods. There were more examples of this at the Interplas Exhibition at Olympia.

There are several designers specialising in 'Perspex' furniture. Willi Landels, Art Director of *Queen* magazine, started using the material six years ago. A chair of his is on sale at the Sander Mirror Company, and he has also done tables, 'a sort of bookcase' and a child's rocking chair. Alexander Albrizzi designs most of the furniture at Sander Mirror Company. This takes the form of cubes in all sizes. Some are made hollow to form storage units, and some have shelves to make bedside tables. Prices are high: it is curious to see that though plastic came into fashion at the lowest end of the market as cheap plastic macs or poor imitations of leather, 'Perspex' has come in at the luxury end of the trade.

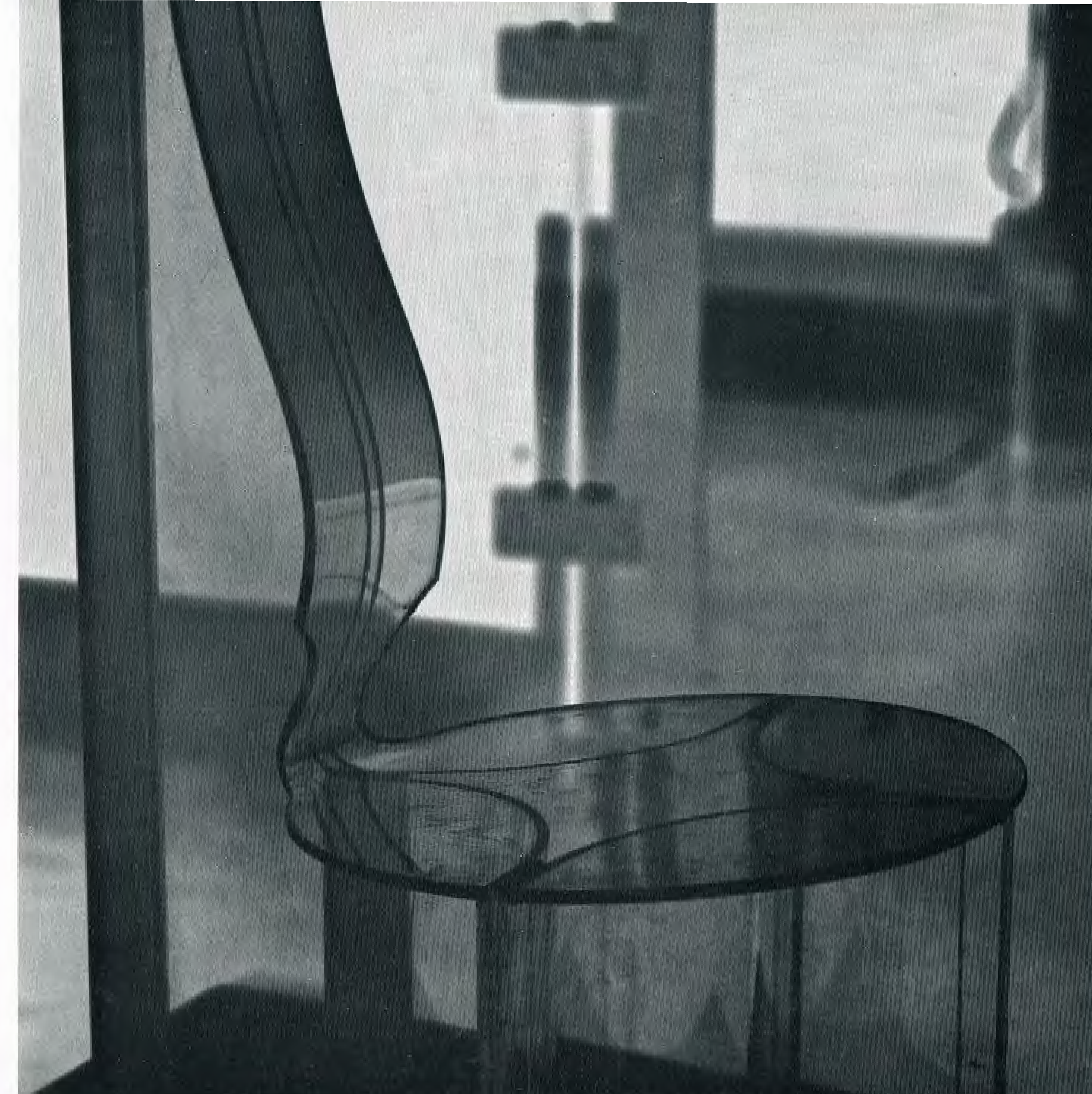
Another furniture designer who is using this material for all sorts of highly decorative objects is Charles Meredith, whose designs are on sale at Anderson Manson. Some exciting 'Perspex' furniture is also being made in Italy by Zanotta and they hope to get some of it into shops here – notably a table of three square 'Perspex' tubes and a sofa-chair. In fashion 'Perspex' has swept the board in 1967 for jewellery. Every stores counter has great heaps of 'Perspex' rings and earrings on display – a lot of them made by Adrian Mann and Corocraft, two big costume jewellery manufacturers. No doubt the craze for 'Perspex' jewellery was sparked off by the Parisian designer Paco Rabanne, who showed the world just how exciting costume jewellery in plastic could be. Almost newer than the jewellery, though, are the 'Perspex' bags made by Plush Kicker (a group of young men who work almost solely in 'Perspex'). Smooth, highly-polished, and engraved in colour, they are perhaps a little too perfect for an everyday handbag.

It looks as though in the home and in fashion accessories 'Perspex' stands on the brink of an expanding future.

Ring in laminated, hand worked 'Perspex' by Suzanne Fry of the Royal College of Art, who also designed the chess set shown on the back cover



Fashion accessories in 'Perspex'



Photographs: Michael Taylor

This 'Perspex' chair, designed and made by Jane Young, was one of several pieces of furniture which was included in the recent Prospex 67 exhibition

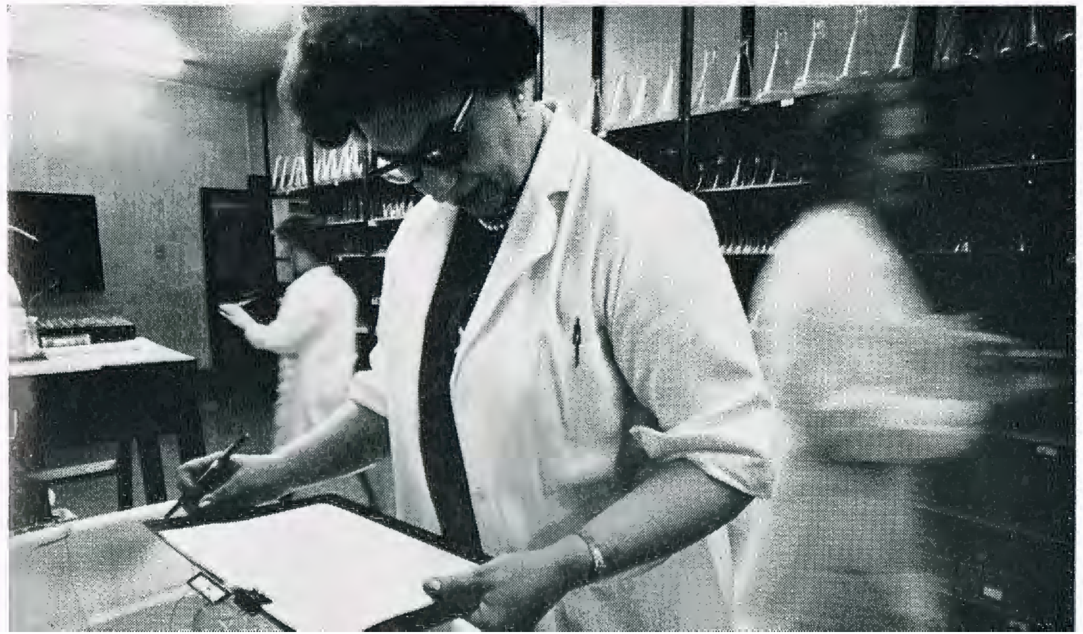
washing up by numbers

Bob Roberts has been supervisor of the Media and Glassware Section since the laboratories opened ten years ago. He is responsible to Mr. Douglas Pickles, the laboratory administrator, and the section is part of the Research Services Group, whose manager is Mr. William Jones. Mr. Roberts has been with ICI since 1955, starting work as an experimental officer in the Research Department.

The laboratories send down their dirty glass for washing up twice a day. Contaminated glass from the biology departments, which might be harmful, is first sterilised in autoclaves (large steam pressure vessels) to kill any organisms, then classified into categories – several hundred different items are used in the labs. Seen sorting glass are Mrs. Elsie Robson (left) and Mrs. May Dunn. They joined ICI on the same day just over 12 months ago. Before that both were shop assistants.

These fermentation flasks filled with corn steep liquor are destined for the microbiology laboratories. Norman Murrow, one of two stewards in the section, loads them into one of the sterilising ovens. He has worked at Alderley since 1964 and was formerly with the Lostock Works at Northwich for eighteen years.

The success of the centralised glass-washing operation depends on the scientists getting the glass they want when they want it and in perfect condition. Much of it has to be sterilised after washing. All of it is checked for any specks of dirt, scratches or cracks – here by Mrs. Lily Wardle – before it is returned to the laboratories. Originally the machines were bought to wash glassware from the biological and biochemical laboratories. About a year ago the Unit also undertook the more complex washing from the organic chemical laboratories. Although there are still some problems to be solved, the results have been encouraging and have helped to reduce the spending on glassware at Alderley by about £3,000 the first 12 months.



Dirty glass collected from the laboratories one morning is ready for use again the next. Laboratories draw their supplies of glass from a central store. The order for a particular department is collected together in polythene tubs, and at this stage a final check is made for cleanliness and for cracks or chips. The breakage rate is surprisingly low – less than one in a thousand. Mrs. Emmi Hunt has been with the section since it started, her first job after sixteen years as a housewife. German by birth, she was a nurse with the German Red Cross organisation before her marriage.

Photographs: Michael Taylor

people in print

Tony Osman

Tony Osman is assistant editor of *Endeavour*, ICI's international scientific review. A schoolmaster before he joined ICI, he soon found that he preferred working on a few articles, written by distinguished scientists, to marking dozens of essays by schoolchildren. Since then, his activities on the borderland where the scientist meets the less specialised reader have increased, and he has written for *The Guardian*, *The Times*, *New Scientist*, and for television. He is chairman of the Association of British Science Writers, and recently led a tour of the Soviet Union by the Association.

Michael Clapham

Michael Clapham is the ICI Director in charge of co-ordinating the Company's overseas policy. He also has particular responsibility for Australia, India and Pakistan, the Far East and Middle East, and Arab North Africa. A printer by profession, he joined The Kynoch Press in 1938 and became its manager in 1940. He was appointed to the then Metals Division Board in 1945 when only 33, becoming a joint managing director in 1952 and chairman in 1960. He was appointed to the ICI Board in 1961. His interests include printing, cooking and, as the owner of a narrowboat, canal navigation.

John Wren-Lewis

John Wren-Lewis of Head Office Research and Development Department is concerned with ICI's long-term research strategy. Originally a mathematical physicist, he joined a research team associated with ICI doing special wartime research and has been with the Company ever since. Well-known as a broadcaster and writer, he is also something of an authority on education and was Distinguished Visiting Lecturer in Education at Leeds University a few years ago.

Evelyn Atkins

Evelyn Atkins retired from the Company in 1963 after 36 years' service. At the time of her retirement she was in charge of the Head Office and Regions staff records section. Since retiring she and her sister have bought Looe Island, the largest island immediately off the South Cornish coast, and they are now running a craft centre there.

Brigid Keenan

Brigid Keenan is a fashion columnist on the Woman's Page of the *Sunday Times*. Her first newspaper job - at eighteen - was with the Westminster Press Provincial Newspaper group and she also worked for a year as a fashion assistant on the *Daily Express* before joining the *Sunday Times* in 1961. She is leaving the *Sunday Times* shortly to become fashion editor of a new magazine.

Anne Bilsland and **Philip Reilly** are in the Internal Information Unit at Head Office, which among other things produces the *ICI Magazine*.

ICI Magazine is published for employees every other month, price 4d. Articles, photographs and suggestions for articles are invited from members of the Company. Payment is made for those accepted. The Company does not necessarily endorse the views of the contributors.

'Miss ICI Penta Paints,' entered by ICI Paints (West Indies) Ltd. in the 1967 Carnival Queen competition run by the Trinidad Junior Chamber of Commerce and sponsored by local Trinidad industries. She was Miss Kathleen Donegan, and her carnival costume represented the victory of the fighting cock – cock-fighting being formerly a national pastime in Trinidad. Designed by Wayne Berkeley, who was also responsible for the Trinidad stand at Expo 67, the costume was mainly of nylon sewn with thousands of sequins on a steel and aluminium framework allowing the wings and tail to be raised by the wearer. 'Penta' is the brand name adopted by ICI Paints (West Indies) Ltd., whose factory is at Arima, Trinidad.

ICI magazine

Chessmen in 'Perspex' designed and made by Suzanne Fry. From an exhibition at the Royal College of Art of designs in ICI's 'Perspex'

Photograph: Michael Taylor